

540,871

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau

Rec'd PCT/PTO 27 JUN 2005



(43) International Publication Date  
29 July 2004 (29.07.2004)

PCT

(10) International Publication Number  
**WO 2004/063548 A2**

(51) International Patent Classification<sup>7</sup>: F02F 7/00,  
F01B 1/12

(21) International Application Number:  
PCT/IB2003/006227

(22) International Filing Date:  
30 December 2003 (30.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
2003-007451 15 January 2003 (15.01.2003) JP

(71) Applicant (for all designated States except US): TOYOTA JIDOSHA KABUSHIKI KAISHA [JP/JP]; 1, Toyota-cho, Toyota-shi, Aichi-ken 471-8571 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): TAKENAKA,

Kazunari [JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, of 1, Toyota-cho, Toyota-shi, Aichi-ken 471-8571 (JP). OMURA, Seiji [JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, of 1, Toyota-cho, Toyota-shi, Aichi-ken 471-8571 (JP). TAKAMI, Toshihiro [JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, of 1, Toyota-cho, Toyota-shi, Aichi-ken 471-8571 (JP). YOSHIIJIMA, Kazuya [JP/JP]; c/o Toyota Jidosha Kabushiki Kaisha, of 1, Toyota-cho, Toyota-shi, Aichi-ken 471-8571 (JP).

(81) Designated States (national): CN, US.

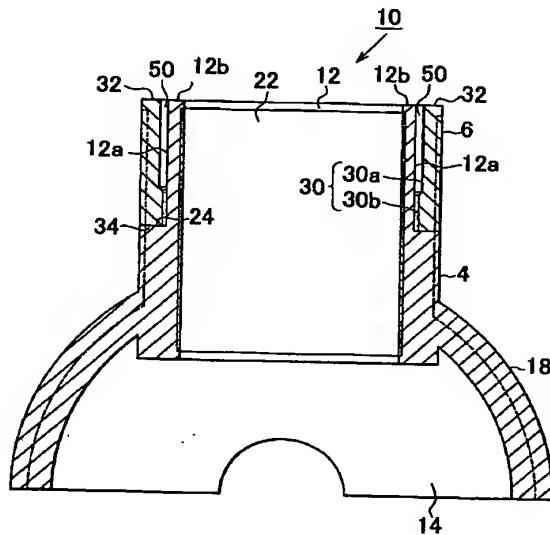
(84) Designated States (regional): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

**Published:**

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CYLINDER BLOCK, CYLINDER HEAD, AND ENGINE MAIN BODY



(57) Abstract: A cylinder block (10) is such that a main body cylinder block (4; 404) and an outer cylinder block (6; 406) are molded separately. As a result, the portion of the die which is used to mold a water jacket (50; 450) does not need to be made thin, thereby increasing the life of the die. Further, cylinders (12; 412) are of a simple shape and the pressure in the axial direction of the cylinder (12; 412) is able to be dispersed substantially evenly between the cylinders (12; 412) and the outer cylinder block (6; 406), thus enabling the cylinders (12; 412) to be thin. Accordingly, there is an increased degree of freedom in design of the portion which forms the water jacket (50; 450). The water jacket (50; 450) and the cylinders (12; 412) can therefore both be made sufficiently thin, thereby contributing to a decrease in both the size and weight of the engine.

WO 2004/063548 A2